POPULAR MECHANICS

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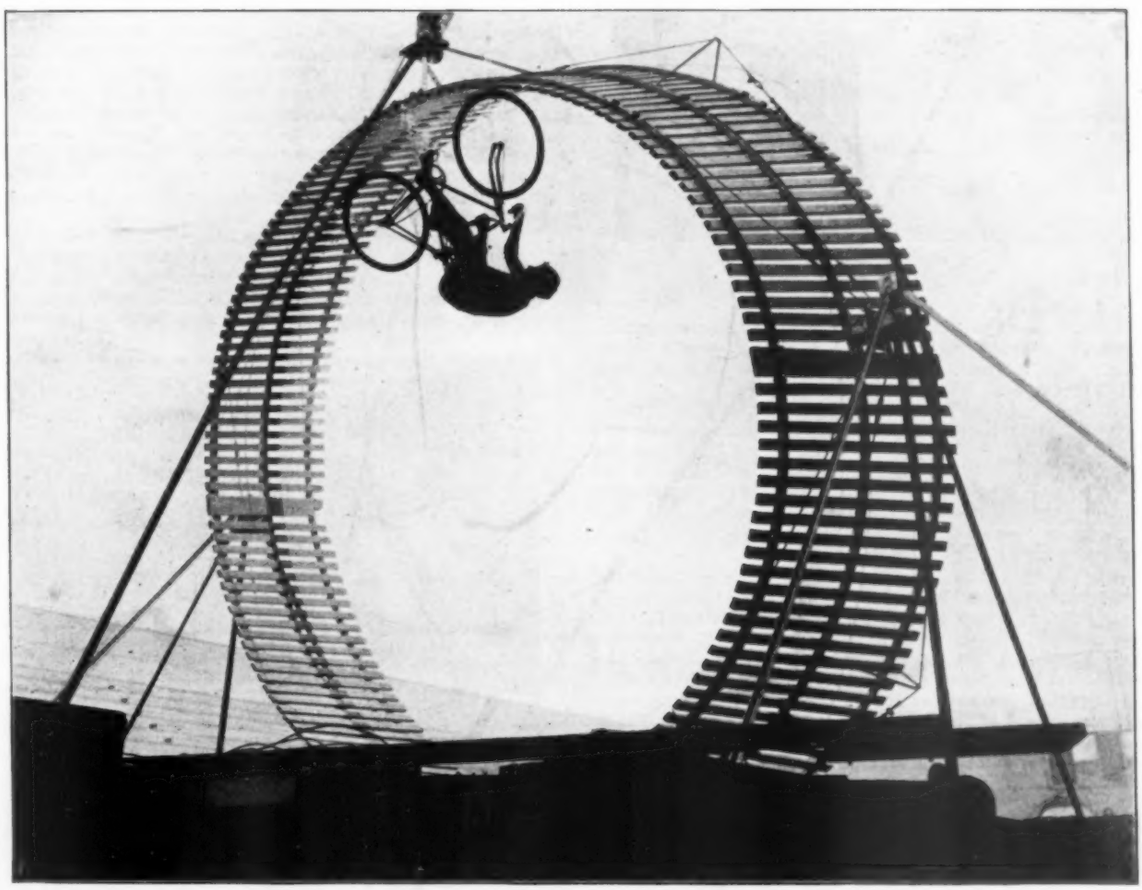
Most Daring Amusement Feat Ever Performed



Instantaneous Photograph of "Circling the Circle," the Newest and Most Sensational of all Reckless Sports--A Performance that Seems to Defy the Laws of Nature

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SMITHSONIAN DEPOSIT

Most Daring of All Daring Sports

"Circling-the-Circle," a Feat Actually Performed that Seems to Defy the Laws of Nature

The American dare-devil spirit that gave birth and favor to the "loop-the-loop," "cycle-whirl," and "shoot the chutes," has seemingly reached the limit in its newest diversion "circling-the-circle." Something of a "cycle-whirl" and "loop-the-loop" combined, the new performance possesses all the most thrilling of the sensations ever experienced in its brother

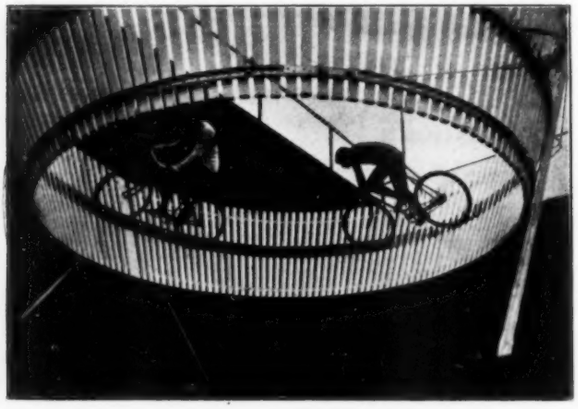


Fig. 1—Circle Being Elevated.

adventurous sports and is probably the most daring feat ever attempted for the amusement of an adventure-loving public.

Whirling rapidly around a wide rim that gradually raises itself from the ground and tips itself to a vertical position, like a great suspended hoop, the bicyclist is riding part the time with his head up, part the time with his body in a horizontal position parallel with the platform and part the time with his head down and his wheel speeding along the under top of the rim in the position of a fly crawling on the ceiling. The act is so very startling that it seems impossible when reading about it and unnatural when witnessed. The laws of gravity seem to be disregarded by the daring riders as they whirl around the tipping circle.

Naturally such a hazardous amusement comes from the West and from the far West. Two San Francisco boys—F. Sheelor, age 21, and Gus Seafurth, age 22—are its originators. They figured out the mechanical possibilities of the apparatus, drew the plans, did the construction work and rode the wheels around the "Circle." The conception and its successful execution are worthy the skill of a master mechanic. Through the efforts of its Pacific coast representatives, Popular Mechanics is enabled to give to the public the first account of this newest adventurous sport, which has not yet been publicly exhibited, and which is destined to attract wide attention in the future.

The performance is, of course, a demonstration of the law of centrifugal force, but utilized in an entirely new and novel manner. The circle is made of wooden slats each 4 feet 10 inches long. These slats are placed 1½ inches apart, and form the "circle." This circle when in a horizontal position is 14 feet in diameter at the bottom, and 15 feet in diameter at the top. In this position its height is of course 4 feet 10 inches.

The exhibition starts with the circle resting horizontally on the platform. One rider or both, enter and start to ride on the platform inside the circle. The speed of the bicycle is gradually increased until the rider is able to transfer the wheel from the floor to the circle around which he travels at a very high rate of speed, and is soon riding with his body and wheel in nearly horizontal position. Electric motors are then started which raises the circle (still in a horizontal position) to a height of 7 feet. Another motor then turns the circle around until it assumes a verticle position, as shown on the front page. The rider has now also changed his position from a horizontal to a vertical. The motors are then reversed, the circle turning back to a horizontal and then lowered to the platform, when the rider decreases his speed until he is once more riding in a vertical position on the platform where he dismounts.

The circle is operated by two electric motors, and so perfectly is it balanced, that a 1-horse-power motor raises the circle, and a ½ horse-power motor turns it in mid air.

Previous trick riders have succeeded in passing once only around a vertical loop, and to do this have had to start on

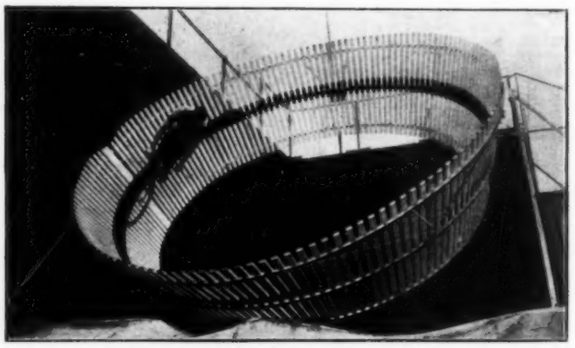


Fig. 2—Circle-Turning in Mid Air After Elevation.

a high incline, down which they ride at great speed. The momentum carried them around but once.

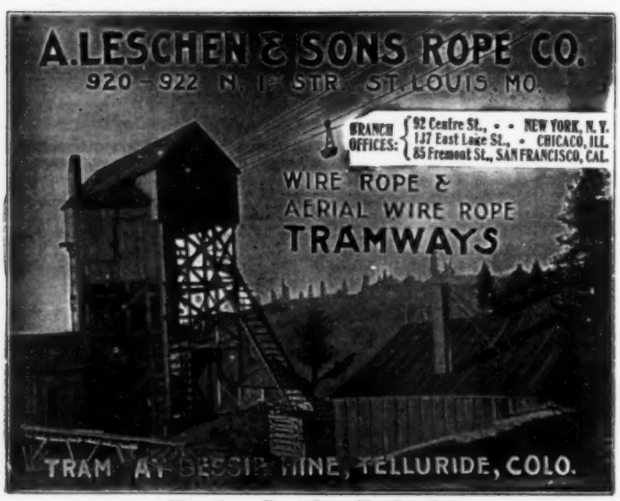
It will be readily understood that it is an utter impossibility for any rider to ever get enough speed to ride around the inside of any loop if he started within the loop itself while it was in a vertical position. The ingenious mechanical arrangement described alone makes the feat possible, and then only by reason of the ability of the performers to ride at a terrific rate of speed. If the speed should be lessened for only an instant the law of gravity would assert its right, and the unfortunate rider would be dashed to death.

MORCONI DOING BUSINESS.

The Marconi system is now handling news matter daily from New York to the London Times. The rate between the two cities is expected to be but little more than present prices from London to Paris.

AUTOMOBILES TO HAUL FREIGHT AT NIGT.

A company has been organized in Chicago which proposes to haul the heavy freight between railroads and stores and warehouses by means of automobiles. Another radical change is that the work will mostly be done at night when the streets are comparatively empty and much better time can thus be made. A saving in time of 24 hours over present methods is promised.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Buttons Grow on Bushes Down in Central America

Remarkable Nut Brought to this Country in Shiploads, From Which Nearly All the Buttons We Use Are Made

No, the ivory buttons you wear do not represent the death of an elephant in the wilds of Africa; your pearl buttons were probably never nearer than you took them to the shell of a bivalve mollusk, and the probabilities are that no rubber tree was ever tapped to produce the hard rubber buttons that adorn your overcoat. Down in Central America there is a fruit-producing palm that has quite metamorphosed the button business, and formed the nucleus for one of the most important industries in the United States. The seed of this fruit contains a milk that is sweet to the taste and relished by the natives. The milk when allowed to remain in the nut long enough becomes indurated and turns into substance as brittle and hard as the ivory from the elephant's tusk. The plant that produces these nuts is called the ivory .plant Most of the buttons now used in America, whether termed ivory, pearl, rubber, horn or bone, come from this ivory plant. Thus the probabilities are that your buttons are made from a vegetable milk, and they grow on bushes.

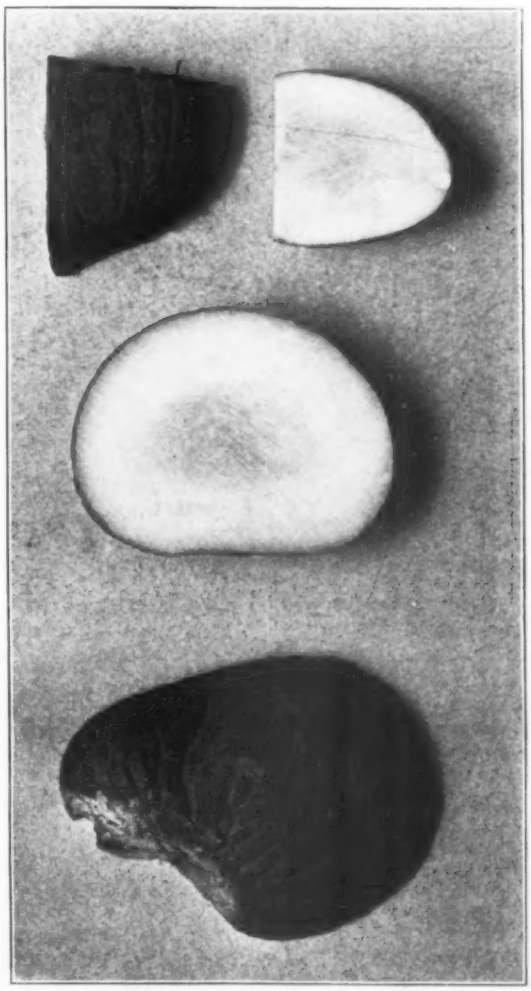
The ivory plant is one of the marvels of the age, and is rewarding its growers with vast fortunes. The nuts are brought to the United States by the shipload and hauled across the continent to the big button factories, from which they issue forth in every conceivable design, color, grade and classification of button.

The ivory plant has recently been discovered in California, but the nut it produces in its wild state is of inferior quality and will not make good buttons. It is believed, though, that with the proper cultivation the fruit would be as valuable as the Central American. If so, the growing of buttons in America would become an industry of importance second only to the growing of corn, wheat and cotton, for everybody wears buttons.

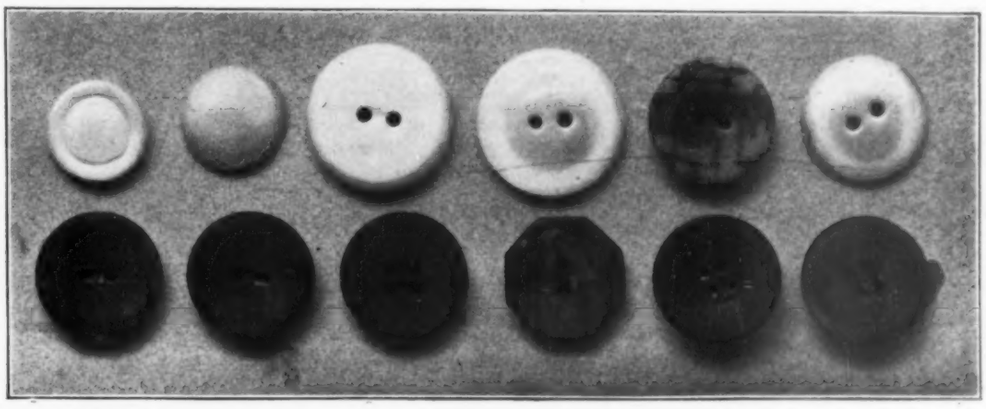
The best ivory nut for commercial purposes is found on the banks of the river Magdalena, in the United States of Colombia, where by some it is called the Tagua palm. The fruit forms a globular head about twice the size of a man's head and weighs from 20 to 28 pounds. The head is a kind of cluster of bulbs, and in all contains from 50 to 60 seeds. The seeds are allowed to dry, and are harvested several times a year by the natives.

The Apparel Gazette, the great dealer's authority on everything that people wear, says: "The ivory nut is used almost solely in the manufacture of buttons, though some factories also make poker chips from them. The nut, however, has superseded the archais mud, rubber and bone buttons in vogue formerly. It admits of wider and more varied treatment for this purpose than any other known substance, and is easily worked. The United States consumes more than one-half of the world's product of ivory nuts and nine-tenths of the vegetable ivory is manufactured into buttons.

"When the nut reaches the button factory it is cut into three slabs. In the process of cutting out, the button is partially shaped. Afterward the thread holes are drilled and countersunk. The button is then sent to the polisher, who uses the shavings and powder made in drilling to polish them in their white state. Afterward they are sent to the designer, who traces on the buttons in indelible dyes the designs needed to make them match the various weaves, coloring and textures of fabrics. After receiving these outlines, if the buttons are to remain smooth and receive another coat of coloring, they are put into dye. If they are to be stamped with a serregated pattern, they are put into a pressing machine fitted with dies of the pattern desired.

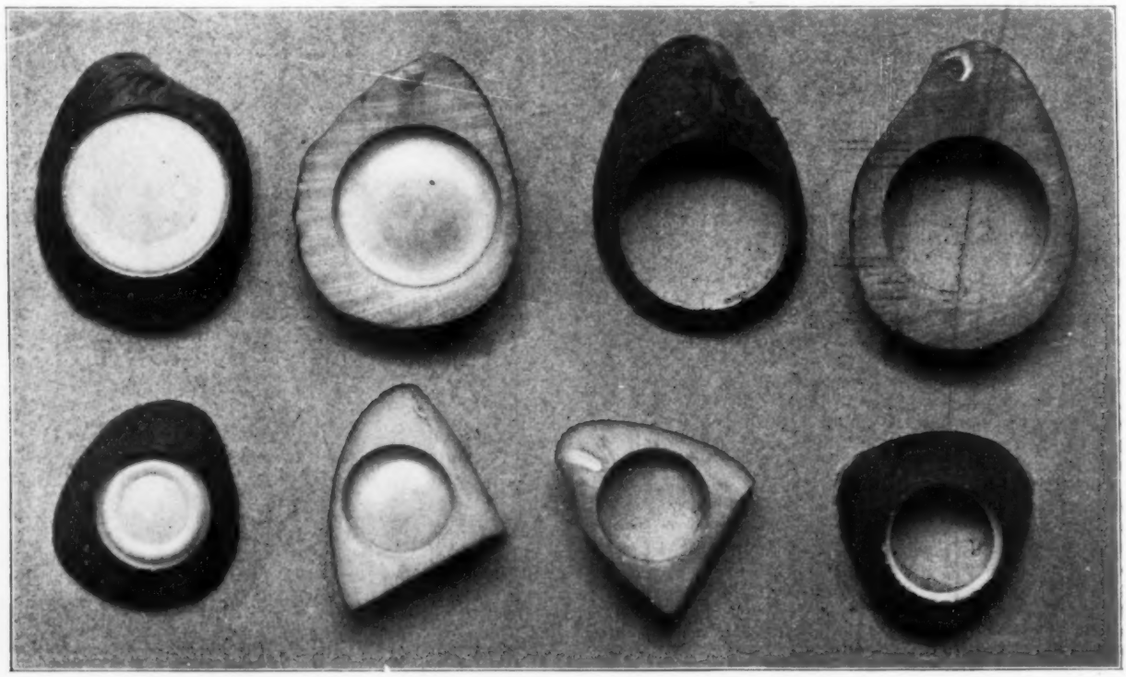


Slabs Cut Out Ready for the Button Maker



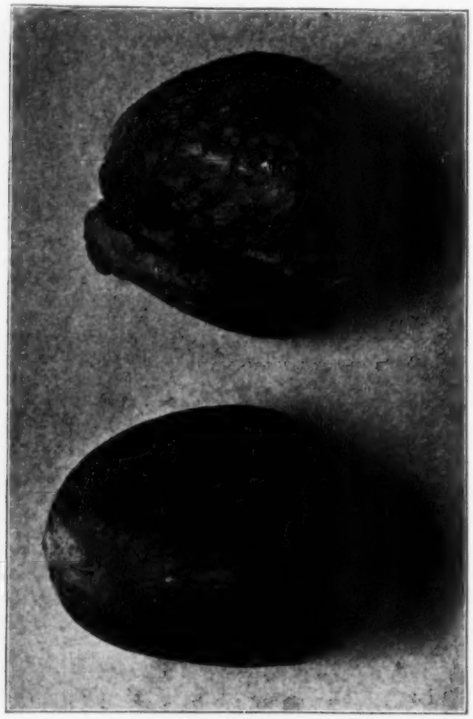
Buttons in Various Stages of Work, Undyed and Finished, Showing Patterns and Shapes

"Vegetable ivory buttons are used on business, semi-dress and full dress suits, and are brought out in patterns so closely imitating the texture and weave of the fabric used on covered heather or a staple black. Some of the new designs just brought out for the fall clothing trade are marvels of beauty in patterning and covering, including shadow effects, glaces



Buttons as they are Formed and Cut Out

buttons, even to including the cloth shank by which it is sewn to the cloth, as to deceive the cleverest. In fact, the ivory buttons are thought more beautiful and perfect than the covered kind, and are certainly more serviceable. The



Ivory Nuts

coloring process has, during the past year or two, made remarkable progress, and so expert have the manufacturers become in this detail that there is not a fabric made which cannot be matched in buttons, whether it be a rich bright and irridescent colors on dark grounds running in red, blue, brown, green and purple.

"Yet it is declared by the button manufacturers that despite the high art now attained in the manufacture of buttons from vegetable ivory, there are still greater possibilities ahead, and each succeeding year has witnessed a more artistic button production."

ONE CLOCK TIMES ALL CINCINNATI.

Every time piece in Cincinnati is regulated by a big clock which stands high in the tower on the Carew building at the west end of Fountain Square. Strangers in the city for the first time on Government or Foundation Squares or on Vine street between Fifth and Sixth streets, wonder why all the people keep glancing up, until they learn that it is consulting the tower clock to see if they are on time. The pace is quickened or slackened according to the story told by the big clock face. All the owl cars are started as this clock sounds half hours and hours between midnight and 6 a. m. Just before 12:30 a. m., for instance, the squares are full of waiting trolley cars. Then the big bell sounds two taps for the half hour, and from all along the line comes the jingle of two bells on the street car gongs as the signal to start.

The clock was put in when the building was erected in 1890. It cost $2,500 and has not varied over 30 seconds in a month. About a year ago one of the slender rods which runs between the movements of the hands was bent by a workman striking it with his head and a new rod had to be put in. Frost sometimes accumulates on the hands and stops the clock. It is a pendulum clock wound twice a week by raising the weights with a windlass. The hands are of light metal construction and carefully balanced.

WIRELESS TELEGRAPH FOR PRIVATE LINES.

A private system of wireless telegraph is now in daily operation between the down town offices of Armour & Co., in Chicago, and their immense packing houses at the stock yards. The distance is nearly six miles.

PASSING OF THE OIL EXCHANGE.

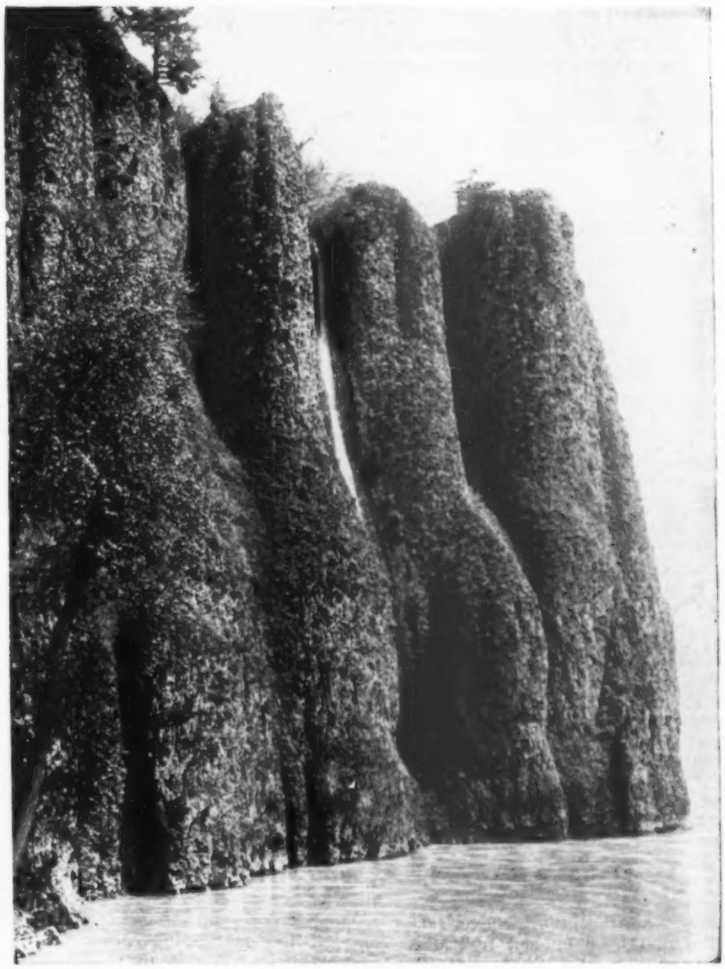
Places Where Fortunes Were Once Lost and Made Have All Gone But One

Of the many oil exchanges throughout Pennsylvania years ago but one now remains. It is in Oil City, and its days are probably numbered. Before the oil business of the country was absorbed by one mighty hand, oil exchanges were located in almost every town of the oil regions, and the daily transactions aggregated millions of dollars. Many a fortune was made and lost; many a "lamb" was shorn and many a "duck" lamed. Then speculation in oil was a raging fever, a delirium of excitement compressing years of ordinary energy into a week. But within the past twenty years Father Time has wrought a great change throughout the region. The exchange at Oil City is almost deserted. Day after day passes without a single sale being made, and frequently the clearances for a whole month do not aggregate 5,000 barrels, though years ago if the sales did not reach 15,000,000 barrels a day business was considered dull. The exchange at Oil City has been in existence since April 22,1878, and was the first to be erected in the oil country.

GOOD JOBS IN EUROPE.

What It Costs the People Over There to Keep Up Their Royalty

It costs the people of Europe fabulous sums annually to support their sovereigns and their families. Russia's come highest, the expense to the people of Russia being more than $6,500,000 every year. The support of the Sultan of Turkey, with his harem and other sources of expense necessary to his swelldom's high station in life, costs the truckling Turks $5,000,000 a year. Austria's sovereignty is the next most expensive, costing $4,600,000 a year. The Prussian ruler and his dependents manage to live on $3,900,000 a year. Poor King Edward has to keep up appearances on $3,075,000 a year, but he has asked for a raise in salary, which it is thought will be granted. The King of Italy has the next best job in Europe, being allowed $3,010,000 for himself and family, with comparatively small expenses. Spain's sovereign is able to live on $1,600,000 a year. The rest of the rulers are comparatively poverty stricken. Sweden's ruler and his family get $884,500 a year, Bavaria's $700,000; the ruler of Belgium, $660,000; Portugal, $550,000; Roumania, $300,000; Denmark, $280,000; Greece, $265,000; Holland, $260,000; Servia, $240,000. These incomes do not include the vast sums received from crown lands and other sources.



BLUFFS OF THE COLUMBIA.—No where in the world are such splendid bluffs to be found as along the course of the Columbia river in Oregon. At places they rise mountain high almost perpendicularly from the water's edge. Small waterfalls from ever flowing springs leap down their moss covered crevices and sparkle like crystals in the sunshine. These world famed bluffs and the other beautiful scenery along the route make a boat trip on the Columbia one of the most delightful outings possible in America.

Wisteria and First Bridge Temple, Tokio, Japan, From the Four Track News

ARCHED BRIDGES IN JAPAN AND CHICAGO.

Chicagoans who now frequent the beautiful Wooded Isle at Jackson Park, and all who were visitors at the Chicago world's fair are familiar with the artistic arched bridges spanning the park lagoons. These were not exactly like most of the arched bridges in Japan—the typical ones being more curved. One of the most noted of the native arches is that shown in the accompanying illustration, "Wisteria and First Bridge Temple," Tokio. This is a sacred spot, revered by all Japanese. The bridges, however, are more artistic than convenient, as any one who has climbed them in Japan or in Jackson Park, Chicago, can testify.

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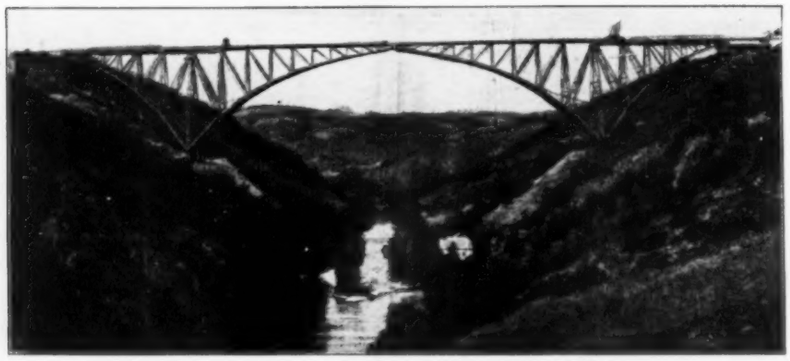
GLASGOW GIVES WORK TO UNEMPLOYED.

There are so many out of work in the city of Glasgow, the authorities are making a list of the most necessitous cases and furnishing work to as many as possible. The number of applicants, however, is much greater than the city is able to provide for.

THE VIAUR BRIDGE IN FRANCE.

A magnificent cantilever steel bridge has just been opened to traffic over the river Viaur, in southern France. It is on the line of railway from Carmaux to Rodez. Three other bridges of similar construction had previously been built—one over the Seine at Paris, another crossing the Neva at St. Petersburg, and a third over the Rio Grande in Texas. The illustration, from the Engineer, London, shows the largest and latest, which is known as the equilibrated or balanced arch bridge. The structure contains 3,000 tons of bridge steel, 550 tons of wrought iron, and 79 tons of cast steel and iron. The track is 217 feet above the river, the main central span is 726 feet long, and the side spans each 313 feet. Total length of the bridge proper is 1,515 feet.



The Viaur Viaduct

North German Lloyds' New Terminal

Science of Pier Construction Displays a High Degree of Excellence in the Great Work at Hoboken

The great pier terminal of the North German Loyd Steamship company at Hoboken, N. J., which marks a new departure in the science of pier construction, is nearing completion. A solid sea wall, 900 feet in length, has been built of granite and concrete. On this foundation a two-story bulkhead building, 850x130 feet, has been constructed of steel columns, filled with and surrounded by concrete held in place by iron jackets. The same material is being used for surrounding the steel girders. Brick arches are used between girders, with concrete floors. The sides of the building are of granite and brick with iron doors. The plans provide for absolutely fireproof buildings. The structural steel and metal work of bulkhead building and piers is protected with Dixon's scilica-graphite paint.

The three piers extending from the terminal are 910x80 feet, 894x80 feet and 874x90 feet. The foundation construction is necessarily of wood piling, on account of the great depth of soft mud and the impact of heavy ocean vessels, which render a rigid construction of stone impracticable. Concrete floors cover the deck of each pier. All steel columns and girders are inclosed with concrete and jackets, as in the bulkhead building. The floors of the piers are divided into three compartments by fireproof walls with double automatic fire doors. The entire sides of the piers are made up of huge iron doors operated by an improved device for raising and lowering. Automatic sprinklers to operate at a certain temperature are installed; also an independent system of fire mains and hydrants. The Multiphase Cable system of automatic alarms, with loose coils of the same cable to lay over stored merchandise, will be used. Numerous improvements for the security and comfort of passengers are included in the terminal.

Pile Driving for Pier No. 2. First Arrival at Temporary Shed, Pier No. 3

HAULED THE FIRE TO THE ENGINE HOUSE.

In Lafayette, Ind., an upholster while delivering a load of furniture struck a match to light his cigar. The head of the match flew off, set fire to some excelsior packing, and soon the wagon was in a blaze. The upholster put the lash to his horses and drove the burning load to the nearest engine house, where it was quickly extinguished.

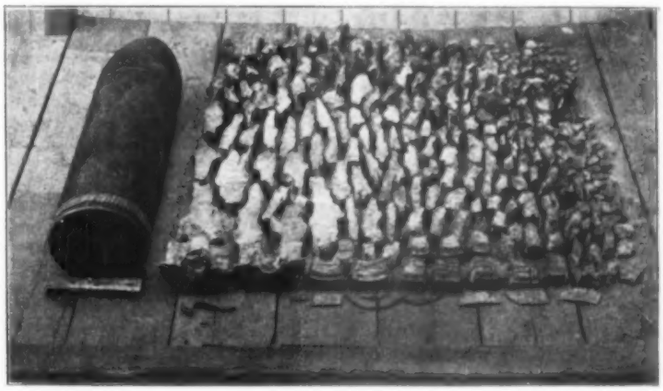
A central Missouri farmer objected to having his new sawmill located on the county line, because if one of the men should happen to get sawed in two he "didn't want no two coroners' inquests over him."

Powerful Explosives in New Shells

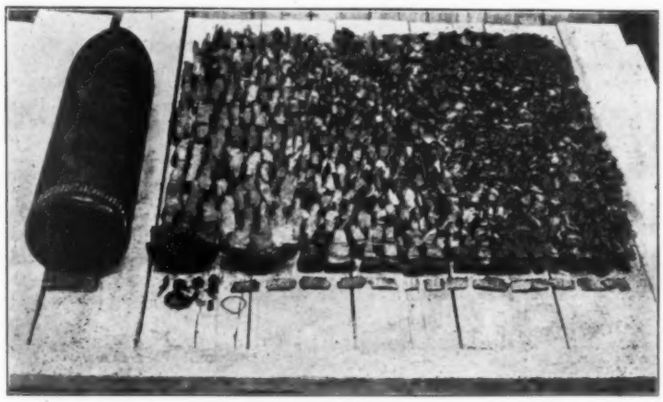
Burst the Projectiles Into Thousands of Pieces After Penetrating Armor

An explosive so powerful that it will burst its shell into fragments only after the shell has penetrated the steel sides of a vessel is required by the army and navy of the United States in selecting projectiles for the great guns. As told in a previous issue of Popular Mechanics, Maximite and Explosive D have given the most satisfactory results in the latest tests at Sandy Hook. However, gun cotton is one of the most stable and best known explosives. The explosive is loaded into the cast iron or forged steel shell which is then loaded in the gun. Then the shell is fired at the face hardened steel plates, from 7 to 12 inches thick, representing the armor of the best protected vessels known to the modern world. The explosive must be so insensitive to shock that it will not explode on impact with the plate but only after the shell has penetrated the plate, and then so powerful that when it does explode it will destroy the plate or vessel armor. The Journal of the Western Society of Engineers thus describes one of these tests:

"A test to which the explosives are subjected is that of firing unfused shells filled with the explosive against plates of varying thickness to determine the maximum plate that can be penetrated without detonation due to shock, the minimum requirement being a 7-inch plate for a 12-inch armor piercing shell. Of all explosives tested, only, Maximite and Explosive D, have successfully passed this requirement and these have been successfully fired through 12-inch face-hardened plates when used in the 12-inch armor piercing shot. The plates in these tests were backed with tin but without sand to determine the results under the most difficult conditions. The projectiles penetrated the plates, exploding in the plates and absolutely destroying the entire structures. The explosives were accordingly adopted for use in the army sea-coast rifles."



Gun Cotton Fragmentation—Twelve Inch A. P. Shell



Maximite Fragmentation—Twelve Inch A. P. Shell

About 500 pounds of the explosive are loaded into each shot, which weighs with the explosive from 1,500 to 2,000 pounds. The results of some of the tests are shown in the accompanying illustrations, which represents the fragments of the shells after they have exploded and been gathered up. The number of fragments varies from as many as four or five in the black gun powder to as many as 7,000 for maximite when detonated in the 12-inch armor piercing shell.

SETS NEW GUNNERY MARK.

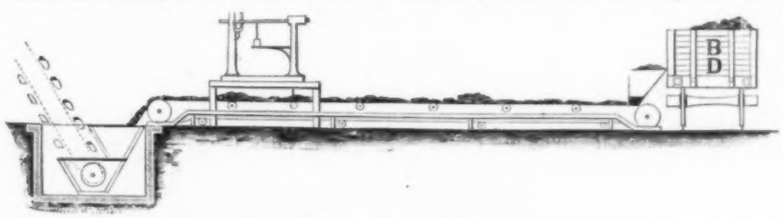
World's records were broken at the gunnery practice of the North Atlantic fleet at Pensacloa, Fla., recently and the battleship Massachusetts made the best week's average of any vessel of the fleet by 2 per cent. The ship's general average with all pieces was 56 per cent. Among the records lowered at the practice were those of the Indiana with its 13-inchers and the Iowa with its six-pounders.

Weighs Material in Transit

Device That Records Weight of Coal, Grain, Etc., While it Passes on the Conveyor

A machine that automatically weighs and records the quantity of material passing over conveyors as they move without disturbing their usual formation and arrangement has made its appearance in England. It shows the aggregate weight of material carried by conveyors, packing bands, etc., and records it automatically without stopping or interfering with their usual travel. Irregularity of feed or supply, it is said, does not interfere with its accuracy.

The Engineering Times, London, says: The measurement and registration of load passing over the conveyor is accomplished by an arrangement of gearing at the extreme end of the steelyard, whereby a quadrant is caused to reciprocate at regular intervals of time, and proportionate to the speed of the conveyor. This quadrant is so designed that its movement will coincide with, and be limited by the position assumed by the steelyard, and, by a ratchet, the amount of movement is communicated to the dial, which shows the gross registration. The reciprocating movement of the quadrant is obtained through toothed gearing, driven from wheels at end of conveyor. This machine is suitable for weighing coal, ore, coke, clinker, sugar, grain, chemicals, chalk, cement, etc., or anything that can be carried by the ordinary forms of conveyors, the machine adjusting itself to all variations in the load and speed.



Weighing Coal in Transit

RELATIVE VALUES OF PAVING.

Mr. Tillson, an authority on paving, assigns the following relative values to a desirable street paving: (1) Cheapness, 14 per cent; (2) durability, 21; (2) ease of cleaning, 15; (4) ease of traction, 15; (5) foot hold, 7; (6) ease of maintenance, 10; (7) favorableness to travel, 5; (8) sanitariness, 13; total, 100 per cent.

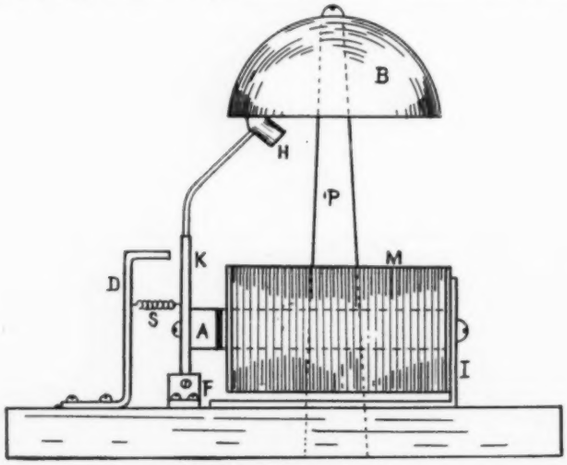
Easy Electrical Experiments

By L. P. Dickinson

A MODEL FIRE ALARM TELEGRAPH—2.

In the preceding chapter we described the arrangement of train of clockwork, so designed as to interrupt an electric circuit in a regular manner. This clockwork was arranged to be set into motion by means of a hook, which was to be pulled down in a manner similar to the fire alarm boxes used in all cities. The amateur can easily design a box for himself, to hold this clockwork, with the starting hook protruding from one side. In this chapter we shall see how to make a bell to work in conjunction with the clockwork.

First of all we shall need a piece of thin sheet iron, very soft, whose length is 3¾ inches, width 3 inches, and whose



Fire Alarm Telegraph Bell

thickness in 1-16 inch or thereabouts. This is bent over at right angles at a distance of 1¼ inches from one end, as shown at I in the accompanying figure. This piece of iron serves as a support for two coils of wire upon iron cores, forming an ordinary electro-magnet. A side view of this magnet is shown in the figure. The iron cores are ⅜ inch in diameter, 2¼ inches long, and are spaced so that their centers are 2 inches apart, and at a height of ¾ inch above the bottom of the iron strip first mentioned. Drive tightly upon the iron cores some circular brass heads, one close to each end, to hold the magnet wire in place which is to furnish the exciting power to ring the bell by means of an electric current. The brass heads are 1¼ inches in diameter. Having carefully covered the iron cores and the brass heads with heavy paper, so as thoroughly insulate them, wind each bobbin full of No. 24 double cotton covered magnet wire. About ½ pound will be required for the two spools.

An iron armature shown at A must be provided, consisting of an iron strip 2¾ inches long, ⅜ inch wide, and of anv convenient thickness. It is fastened transversely at its center to a small strip of brass, shown at K, whose length is 1⅝ inch, and is thick enough to be quite stiff. This strip is pivoted between two small upright supports one of which is shown at F. When exactly vertical, the strip K should leave a clear space of 1-64 inch between it and the iron cores, this space being left so that the ends of the cores may be covered with small pieces of paper glued in place with shellac. These pieces of paper are to prevent the armature from touching the cores.

At D is a stiff piece of brass, which serves two purposes. First it serves as a support for the spiral spring S, which draws the strip K toward the left. Secondly, it serves as a stop for strip K, preventing it from going too far toward the left.

To the upper end of K is fastened a wire, which carries at its upper end a rather heavy piece of brass, to serve as a hammer for the bell B. The amateur will be able to secure an old gong of some kind, perhaps from a clock. As the dimensions of these bells will vary, the reader will have to adjust the position of the hammer H, and the gong, to suit his individual case. When the strip K moves to the left, and brings up against the end of D, the hammer H should just barely clear the inside of the bell. Then when the hammer moves swiftly, its momentum will be sufficient to cause it to strike the bell sharply, and then bound back, allowing the bell to give a sharp, clear tone.

The supporting base for the whole arrangement is made of a piece of smooth pine or whitewood. The post P is mortised firmly into the base, passing between the coils of wire. The post is about 4¼ inches in height.

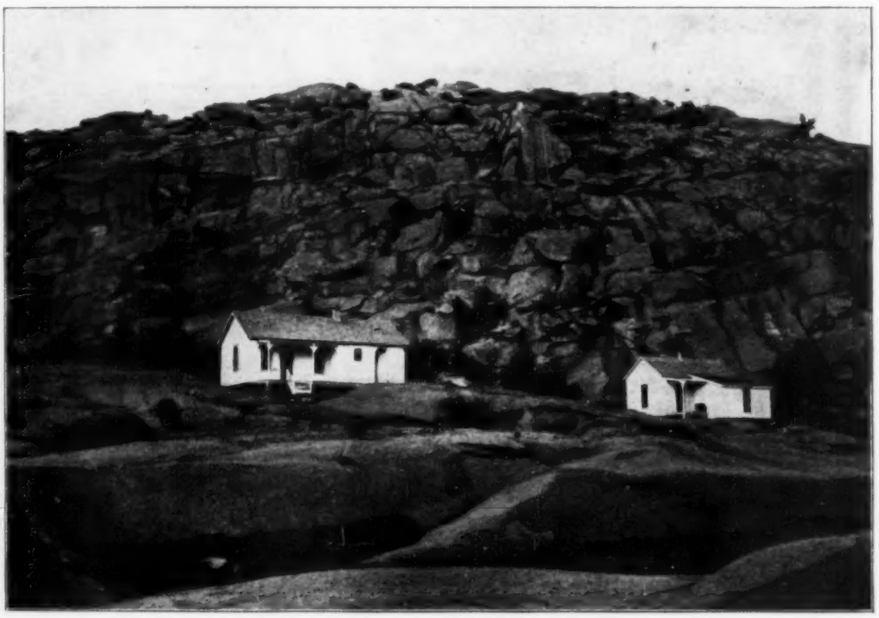
The bell and clockwork are to be joined in series with three cells of gravity battery. Connection is made with the insulated spring on the clockwork, and to the brass frame of the same. As arranged, the number of the box to be struck is 243. When the circuit is closed by the clockwork, the armature A should be drawn against the cores. When the circuit is broken, it should spring away, striking a sharp blow on the bell.

FIND A MOUNTAIN OF GRANITE

A mountain of granite, two miles long and a half mile wide, has been discovered in Oklahoma. Already three companies have been organized and bought up the greater part of the remarkable deposit. The entire deposit lies exposed just as is shown in the illustration. Houses have been built on the solid ledges of red granite that require no stripping. Great boulders of the rare rock lie in waiting for the stone cutter to begin work.

Monumental News says: The mountain produces several varieties of granite, the fine grain being quite similar to the Wisconsin reds, with a chocolate cast, and the coarser grain resembling very closely the famous Scotch Peterhead. It is all adapted to monumental work, and as such, as well as for buildings, will find a ready market.

The mountain lies near the town of Granite, on the new line of the Chicago, Rock Island and Pacific.



A Mountain of Granite Discovered in Oklahoma

California Still the State of Gold

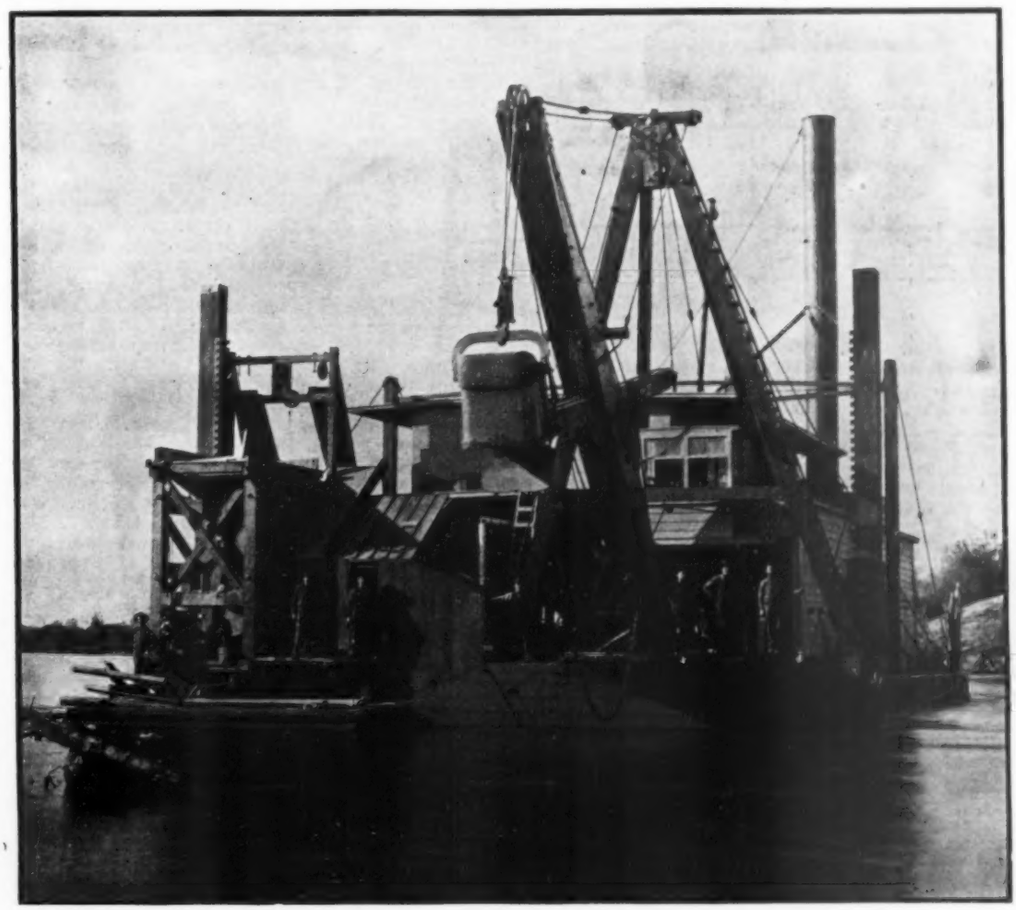
Modern Mining Methods Make Abandoned Lands Wealthy --Big Copper Output

California's golden days have not yet ended. Recent remarkable successes attained through more modern methods of mining lead many to believe that there is yet more gold under California's soil than has ever been taken therefrom. The enormous output of copper and silver that has also resulted from operating the mines with improved mining machinery has helped to cause the wondrous revival of interest in California mining affairs. The copper production is considered of especial importance in view of the enormous demand for that metal since electricity has begun to play such a conspicuous part in our present civilization. This is the electrical age and electricity is dependent upon copper for its development for all kinds of commercial usage. The growing scarcity of copper as previously supposed has caused many noted inventors to search for a metal that would serve as a substitute but their efforts were in vain other than to establish the fact that copper remains undisputed king in the development of electrical energy.

The gold dredging industry has recently taken a great stride in its history, which up to the present year has not been a very brilliant one. Dredges used in harbor improvement and land reclamation were formerly employed, but they were found utterly unfitted for work in the rough and rapid streams where gold is usually found. So a dredge, adapted especially for the purpose of gold dredging, was designed and put into service. The results have been the unearthing of fortunes in gold from land that was heretofore considered not worth working. The illustration shows a new single bucket dredge at work on one of the California streams in the gold district. It has a capacity of 100 cubic yards per hour, which is delivered in an almost continuous stream into a perforated revolving screen. In describing this dredge, Enterprise of San Francisco says:

The screen is set on a grade, so that the heavy material gradually travels through it and is discharged overboard at the stern of the dredge. A perforated water-pipe extends into the screen, the water at the rate of some 3,000 gallons per minute thoroughly washing the gravel and finding its way with the gold and fine material through the perforations of the screen and into a distributing box; from thence it goes on to the gold-saving tables, which are divided into sections and are covered with cocoa matting and expanded metal. The excellence of these tables is shown by the class of gold saved on them, much of it being so fine that it can only be seen by the aid of a magnifying glass. The water is supplied by a centrifugal pump and the whole of the machinery on the dredge is run by a marine engine indicating less than 40 H. P.

The dredge is handled by two men, one a fireman and the other a winchman. It is mainly owing to the excellence of design of the power winch that a dredge with the large capacity of 2,500 cubic yards gross per day requires only two men on a shift to operate it. The winch has six barrels, four of these control lines running from the four corners of the dredge, the fifth carries the head line, and the remaining one raises and lowers the ladder.



Gold Mining with Up-to-Date Appliances—New Single Bucket Dredge at Work

JAPANESE SHIPYARDS.

Shipbuilding is rapidly developing in Japan. Thus the comparatively speaking recently completed yards have turned out during the past year seven sailing vessels, having a combined tonnage of 1,170 tons, and 41 steamers with a displacement of 34,402 tons, whilst the total tonnage launched during 1901 only amounted to 20,763 tons.

The Engineer says that one of the first difficulties of the manufacturer in endeavoring to standardize his work for the designing of railway bridges is the great number and variety of specifications as used by various railway and bridge engineers.

SHOP NOTES

STEAM BENDING UNDER DIFFICULTIES.

The accompanying sketches are intended to show how I bent the wooden shoes for a friction clutch, without any special tools, says a writer in the American Machinist. The clutch in question was a 40-inch clutch coupling, the shoes being, as I recollect them, about ⅞ inch thick, 4 inches wide and 10 inches long.

We had plenty of 4-inch maple plank on hand, and sawed four ⅞-inch strips out of it, the strips being about 8 feet long. This was enough to make all the shoes we wanted and have some left over. After sawing, the strips were smoothed with a plane, to lessen the work of fitting. Some old strips of sheet brass of about No. 30 B. W. G. and of the proper width, which we happened to have on hand, were cut into lengths, the ends annealed, and then turned over the ends of the wooden strips and secured by screws, as shown in Fig. 1. The object of the brass strips was to prevent very much stretching of the fibers on the outside of the stick.

FIG. 1
The Strips of Wood and the Clamps

FIG. 2

One of the steam boilers at the plant being out of commission, I determined to use it as a steaming box. It was a horizontal fire-tube boiler of the ordinary type, with a manhole at the front end to serve as a door. I put a couple of short sticks crossways of the boiler and laid the maple strips on them, shut the manhole and filled the boiler with steam. While the wood was steaming, we rolled an old 40-inch pulley out of the cellar, laid it on the ground outside the boiler-room and drove a couple of stakes between the arms to keep it from turning.

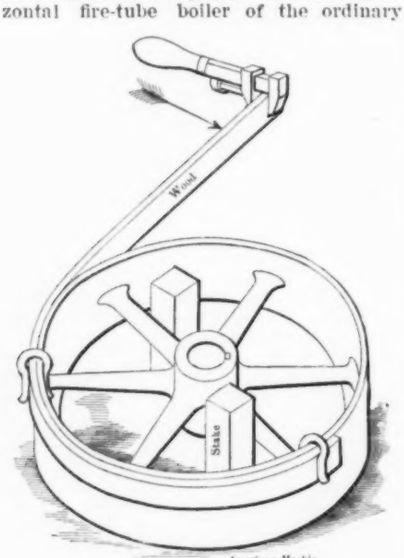


Fig. 3.—Bending the Strips

I next called on the blacksmith and got him to make a few clamps of ⅝-inch round iron, like the one sketched in Fig. 2.

After three or four hours we judged that the wood was sufficiently soft, and shutting off the steam, we knocked out the manhole plate and fished a strip of wood out with a pair of long-handled tongs.

The strip was placed in position, a clamp driven on, a big wrench put on the other end, and the strip was slowly bent around the pulley. A second man followed the wood up with a hammer, rapping it into place and driving on clamps where necessary. Fig. 3 shows the operation of bending. When one strip was secured, the pulley was turned over and the operation repeated on the other side. A second 40-inch pulley was used for a former for the other two strips.

The wood was dried by putting the strips (pulleys and all) on top of a boiler. After a few days' drying, the clamps were knocked off, the brass bands removed and the best portions of the bent wood sawed to approximate length and put away for use as shoes for the clutch.

COMPOSITION OF BRASS.

In a valuable article on brass and its casting in the American Machinist, a writer gives the following examples of alloys for several grades:

FOR SOFT BRASS.

Copper (scrap), 16 pounds; zinc, 4 pounds; lead 1½ pounds; tin ½ pound. This metal has a good bronze color, casts well and is easy to work.

No. 2 Soft.—Copper (scrap), 16 pounds; pewter, 1 pound; yellow brass, 6 pounds; lead 2½ pounds. This also is a good running alloy, and cheap to finish.

FOR A HARD METAL.

No. 1—Copper, 16 pounds; lead 3 pounds; tin, 1 pound; phosphorus, ½ inch.

No. 2—Copper, 16 pounds; tin, 1½ pounds; lead, 2½ pounds.

No. 3—Copper, 25 pounds; tin, 3½ pounds; lead, 1½ pounds; yellow brass, 6 pounds.

No. 4—Copper, 20 pounds; lead, 3½ pounds; tin, 1½ pounds; phosphorus, 1 inch.

No. 1 has the advantage of being easy to machine. No. 2 is a much better alloy, suitable for bearings and so forth. No. 3 is a better and more expensive alloy than No. 2. No. 4 is a hard alloy; breaks easily, with a dense reddish-gray fracture.

HINTS TO INVENTORS.

The automobile press announce there is a real demand for a perfect electrical timing machine, with which to record auto races. The devices at present in use are pronounced to be little more than stop watches with two buttons, operated by a man at the start and another at the finish.

FOUNDRY TOOLS AND APPLIANCES.

Much has been written on foundry practice, but how seldom do we meet with any thing that bears the stamp of real foundry experience! That can only be accounted for by the fact that the men who are skilled in the details of molding and casting are seldom skilled in the art of expressing their knowledge in writing. It is refreshing, therefore, to come across such an article as that contributed on Foundry Management in "Engineering Magazine." Mr. Robert Buchanan is evidently experienced in the molder's art, a close observer of foundry methods, but also able to give the result of his observations in terse and well-chosen words. We have been particularly struck with what he has said about the use and abuse of the minor plant and tools which are employed in molding operations. It accords exactly with what has so often come under our own observation. He says some foundry people commit the great mistake of trying to carry on work with the smallest possible equipment of riddles, sieves, buckets, brushes, shovels and other tools whose name is almost legion. The only thing these economists do not grudge is the time and money wasted because of this shortage. And he refers to a large foundry where the economy was so thorough that one molder used a 56-pound weight with a recessed bottom as a "swab-pot," and it was not at all uncommon to see a molder brush off the joint of his mold with his cap; the brushes were in the store, and stayed there. The men were paid so much per hour, so they did not mind; if they had been on piece-work rates there would have been trouble. The economy in minor plant and wastage of time had a result not difficult to guess. Money was lost (fortunately by those with some to spare) and the presiding genius had to seek an outlet for his economical tendencies in another than the foundry business. It may be taken as a safe rule that no workman ought to have to wait one moment for another to be done using sieve, riddle, brush, or whatever it may be. Each molder should have a complete outfit of tools for his own particular use, these tools having his check number branded on each. Any bad usage of tools is by this means avoided, as responsibility for their condition is immediate, and in flagrant cases, punishable. As a matter of fact, such a condition hardly ever arises, as the molder has every inducement to keep his tools in the best order. Where tools are few in number and so have to be used by all and sundry, they get thrown about from one to another, and as no one in particular is responsible for them, they last only half the time they ought to do. Under such conditions more tools per man are used than if each had a set for his own use. How is it that shortage of tools is seldom seen in piece-work foundries, but often in those where the hands are paid time rates? Piece workers would not put up with the delays due to such shortage, but evidently the employers who pay time rates and allow a shortage of tools are not aware of what a fearfully bad bargain they make. Give a molder all the tools he can use, hold him responsible for their proper and legitimate use, and if so used, the sooner he uses them up the better for the employer.

HOW TO WORK ALUMINUM.

Aluminum is rapidly increasing in use and the purposes to which it can be applied are steadily growing in number. In the American Machinist for March 26 an extremely interesting article discusses the various phases of the subject, and from it the following is quoted:

The two great secrets—that is, if we may term them secrets—in the working of aluminum, either in its pure state or in any of its alloys, is the use of a proper lubricant, and in the proper shape of the cutting edges of the tools.

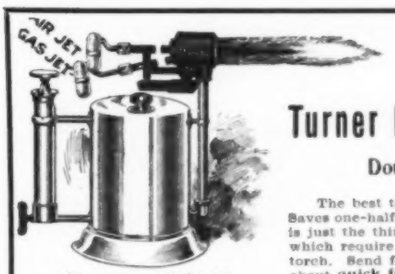
There is a great variety of grades and alloys of sheet aluminum on the market, so numerous that no difficulty should be experienced in procuring that suitable for any special purpose. Aluminum may be had in much the same variety as sheet brass, or in all degrees of hardness, from dead annealed stock to the pure, stiff, springy aluminum. Next to the pure metal is a hard grade of alloys, ranging from dead soft stock, which will spin, draw or form up hard and stiff, to the same grade hard rolled. After that comes another set of alloys which are replacing sheet brass in a large variety of kitchen utensils, novelties, parts of instruments, mechanical appliances, and the lithographer's stone. Lastly there is another grade of alloys which has been perfected lately from which great things may be expected, which are beginning to be used for drop forgings. Experiments have shown that drop forging can be accomplished with this metal more easily and satisfactorily than with many others, because certain alloys of aluminum can be worked cold.

Now about working the metal: In turning, milling or drilling aluminum in its pure state more difficulty has been experienced than in the press working of the sheet metal. All these difficulties disappear if the tools are made properly and the right lubricant is used. The tool should be made with lots of top clearance and bottom rake, and instead of the stub point, as used for brass, it should be lengthened out. The top clearance should be sufficient to allow the turnings to free themselves easily and not clog around the point. Lastly the tool should be tempered at a light straw, and stoned to a keen edge.

As to the best lubricant for the machine operations of turning, milling or drilling, crude oil is best for milling and kerosene for drilling, while for turning, soap water, and plenty of it, will give grand results.

Articles of aluminum may be easily annealed by heating in an ordinary muffle taking care not to get the temperature too high. The proper annealing heat lies between 650 and 700 degrees Fahr. The best test for the heat is to take a soft pine stick and draw it across the metal. When the wood chars and a black mark is left on the metal, it is sufficiently annealed and is in the proper condition to proceed with the further operations.

Next to the working and machining of aluminum the most important processes lie in the polishing and finishing of it. After the articles have been produced, a fine polish can be given them by first using a rag buff treated with Tripoli to cut down with. The high finish can then be attained by using a dry rouge that comes usually in lump form, first grinding it to as fine a powder as possible.



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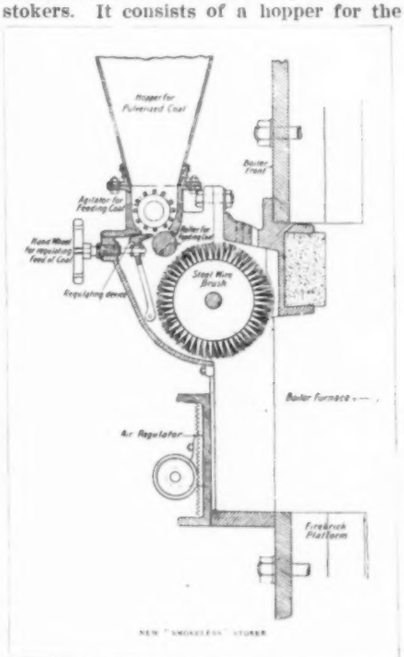
PASSING OF THE STATIONARY FIREMAN.

Mechanical Stokers for Powdered Coal Working a Revolution in Modern Methods

Mechanical stokers for powdered coal, now so popular, seem to presage the doom of the stationary fireman. The pulverized coal works a wonderful saving in fuel and gives a far more satisfactory and uniform heat. Herewith is illustrated one of the newest smokeless stokers. It consists of a hopper for the



reception of the coal at the foot of which there is a pulverizer, which reduces the coal to fine powder.

The Engineering Times, London, says: In the case of a large range of boilers a special pulverizer may be employed, by means of which the whole of the fuel required can be reduced to powder and fed to the various furnaces by means of conveyers. In front of the furnace there is a rapidly revolving brush, which acts as a fan, and impels the pulverized material, along with a large volume of air, into the furnace. Being ignited, it bursts into a volume of flame, so that the whole of the furnace or combustion chamber is filled with heated gases. Means of regulating alike the volume of air or coal admitted are provided, so that it is quite easy to fix the heat evolved and to insure perfect combustion. The bottom of the furnace is formed of a bed of firebrick, and as there is no need to open the furnace door no superfluous or cold air is admitted. The stoker is designed to be very durable, and every part is accessible. When the boiler requires to be laid off it is only necessary to shut off the supply of coal. A small supplementary grate is fitted for ignition purposes. The stoker is specially adaptable to water-tube boilers.

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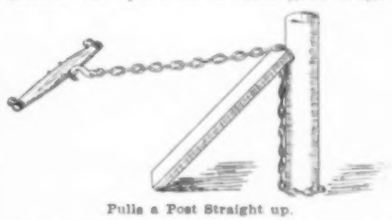
EXTRACTION OF METALS.

In a new German process metallic residues, etc., containing tin, copper, lead, zinc, etc. are treated with a solution of sodium bisulphate, or ore fused with the salt. Tin is obtained as an insoluble salt, the oxide, while metals such as nickel, copper, zinc and metals forming soluble sulphates are easily separated from those forming insoluble sulphates, such as lead.

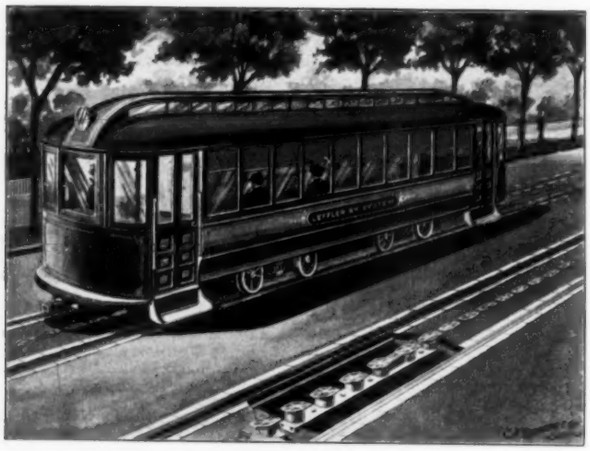
INGENIOUS SCHEME OF PULLING POSTS.

To pull out fence posts easily take a 2x4 scantling 3½ feet long and lean it against the post at a 45-degree angle.



Pulls a Post Straight up.

A ⅝ iron pin driven into the top end to pass through a link of the chain will prevent it from slipping. Hook a chain close to ground, passing it up the post over the top of the scantling. One horse will pull all ordinary posts, as this method will lift it straight up.—J. W. Dysart, La Porte, Ind.



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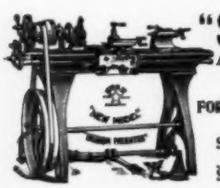

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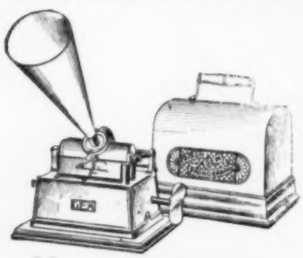

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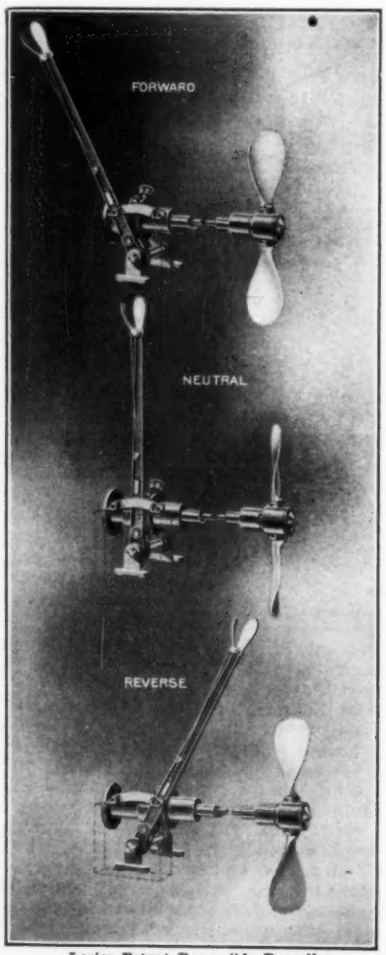
Mention Popular Mechanics.

New Reversible Boat Propeller

A patent reversible propeller wheel which has just made its appearance overcomes quite all the objections urged against the reversing blade propeller and will aid greatly the handling of small boats. It is made by the Lozier company.



Lozier Patent Reversible Propeller

The propeller, which is shown in the illustration, permits of the use of what is practically a solid brass shaft, the reversing sleeve being dispensed with. The shaft is bored to receive a small rod and by means of this rod the angle of the blades is changed

The American Shipbuilder says: The hub is entirely enclosed, giving the wheel the appearance of a solid propeller wheel, and the fact that the hub is enclosed and smooth, prevents any great liability of the wheel becoming entangled with weeds, grass, etc.—or, if it should become fouled in this manner, there being no sharp projections, nuts or angles, the accumulation is easily thrown off by turning the wheel two or three revolutions in the opposite direction. The mechanism inside of the hub is very simple, there being no gears or wheels used. When the reverse lever is thrown forward to the first notch of the quadrant, the propeller forms a perfectly true screw, of suitable pitch to absorb the full power of the engine. When the reverse lever is placed in a central position, the blades stand at right angles to the shaft and form no resistance to the water. By throwing the reverse lever backward, the blades are changed to the reverse pitch, making it possible to stop the boat within its own length, or to back instantly, if desired.

WILHELM'S WONDERFUL TALKING CLOCK.

Emperor William of Germany probably has the most remarkable clock in the world, according to reports in the American-German papers. It is a phonograph clock, the reports state, made by a Geneva inventor, that reminds the emperor of business engagements and other intended transactions. If he wants to drive to the chancellor's at 11 o'clock he informs the phonograph clock, moves the hand to 10:30 o'clock and at that minute the phonograph clock shouts: "See here, your majesty, its about time to order the carriage for Buelow's." While William breakfasts the clock tells him a dozen things he must not forget, and if the eggs are bad or the cutlets burned, he steps to the clock and tells the phonograph that "cook will get his walking papers." The cook must report to the clock immediately after meals and hear what his majesty thought of the food set before him. The kaiser thinks the phonograph clock a wonderful success and has ordered half a dozen for the different palaces.

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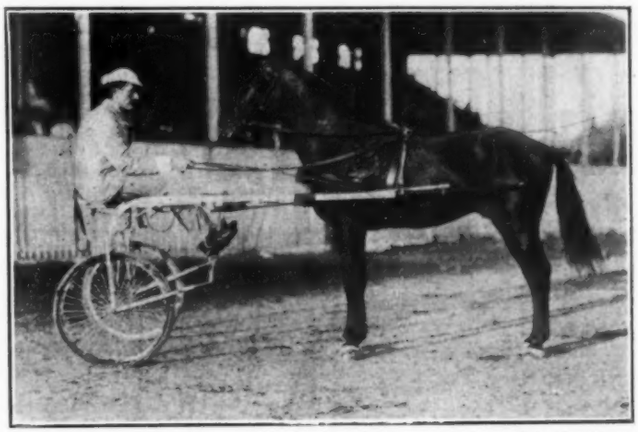
DRIVES "THE CART BEFORE THE HORSE."

At White Plains, N. Y., there is a horse that actually drives his master in a cart in front of him, and the rider declares that he finds the experience not at all uncomfortable.

An exhibition of this peculiar feature was given recently at the West Chester Horse Show at White Plains, as fully described in the Rider and Driver, and attracted great attention. Of course, this method of driving has to be practiced where there is little traffic.



By Courtesy of Rider and Driver and Outdoor Sport.

Dewey Driven Before the Horse—White Plains Fair in Connection with Westchester Horse Show

A METHOD OF PROSPECTING FOR MINERAL ORES.

The method of prospecting for mineral ores, developed by Messrs. Leo Daft and Alfred Williams, has been tested recently in Wales for zinc ores, and in Cumberland, England, for hematite. An alternating electromotive force of high potential, set up by an induction coil, is applied to two electrodes which are inserted in the ground. These set up an alternating current between them, and the direction of current flow through the ground is explored by means of two other electrodes and a telephone. If the ground is homogeneous, the equipotential lines determined will show no distortion; but if the conducting strata lie in the path of the current, this will distort the direction of current flow, and the location of this strata can then be determined. The method was used to locate the extension of a lode at the Cymystwyth Mines, which heretofore could not be found, due to faults, although tunnels had been run for this purpose. The electrical method located the lode without difficulty. It is stated that the influence of the water in the ground is not such as to prevent the method being employed. An improved form of breaker, operated by a motor, for exciting the induction coil, is used, with the latest type of apparatus. The system is thought to be particularly suitable for those classes of ore which occur in pockets.—Abstracted from the Electrical Engineer (London).

"The few lives lost on British railways, compared with the number in America, show that British methods are not so very defective. Certainly the British public may congratulate itself on the fact that much higher value is set upon life and limb here than on the other side of the Atlantic."—Chairman London & Southwestern Railway Co., in Page's Magazine.

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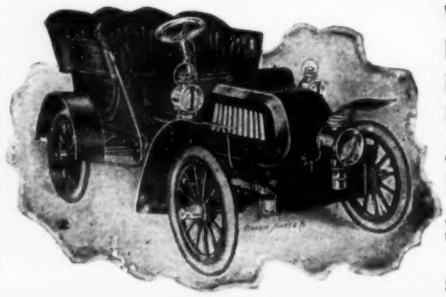

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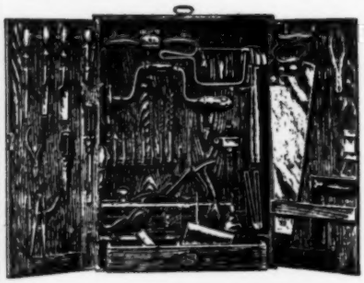

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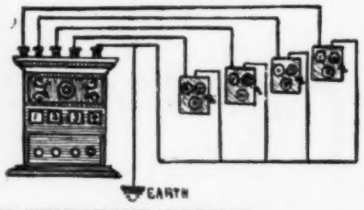

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PROPOSAL TO BUY CANADA.

Canadians are Indignant and Say the Dominion is Not For Sale

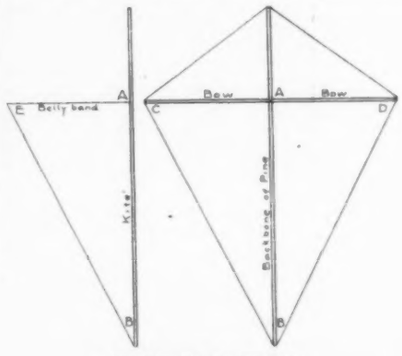
Congressman De Armond has made a proposition to empower President Roosevelt to negotiate for purchase of the Dominion of Canada from Great Britain. The congressman says that if the nation must grow it would be better to expand northward on the continent and not across seas. The Canadian press is very indignant over the proposition and with one voice declares that Canada is not for sale. "The purchase of the Philippines from Spain is probably the germ from which this idea sprung," says British Consul William Wyndham, "but there is considerable difference in the two cases. Canada, herself, would have to consent to any annexation scheme and, knowing what I do of the sentiment of the people, I do not think there is much possibility of their agreeing to be sold."

The Toronto Globe, the organ of the government, in an editorial on the subject, says: "We must not become engulfed in the maelstrom of American political complications."

HOW TO MAKE A TAILLESS KITE.

Editor Popular Mechanics: Will you be so good as to let me know how to make a kite without a tail.—Edward Weesner, 6 years old, Clayton, Ind.

The tailless Holland kite is one of the most successful of this style. The illustration shows how it is made. The center stick B F is 4 feet long; the cross stick C D, Fig. 1, is a bow just 3 feet long, with strings attached to each end and tied at the back to give it the proper curve. This curve must be varied with the strength of the wind. Tighten the



Skeleton of Tailless Kite

bow cord if the wind is strong and give it more curve. The bow and strings are fastened to each other one foot from the upper end of the stick A A, Fig. 2, the center of the bow. Attach the belly band at the contact of the stick and bow A, and at the lower end of the stick B. To find out the length of the belly band, let its angle just reach the end of the bow C or D, at which angle the kite string should be attached. This kite may be any size, but the proportions must be according to the one here described. The two sides must be equal in weight. Lift the kite by the belly band, and if it tilts to one side paste pieces of paper on the lighter side to make it balance. The stick and bow must be as light as possible for the duties they are to perform.

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RIDIN' 'ROUND THE HERD AT NIGHT.

By James Barton Adams.

Lots o' times to think, you bet,
Underneath the watchin' stars;
Jest the very time to let
Down the past's moss-covered bars
Gives the soul a pious tone,
See things in a solemn light,
When a feller's all alone
Ridin' 'round the herd at night.

Gits a thinkin' o' the days
When his life was in its morn,
Of the sports an' boyish plays
Round the home where he was born.
Pictures o' the past he sees,
Some are shaddered, others bright
As a summer day, when he's
Ridin' 'round the herd at night.

Sees a mother bow her head
Pleadin' with the Lord above,
An' the tears she of'n shed—
Jewels of a mother's love.
Sees her glad, approvin' smile
When he tried to do the right—
Conscience welts it to him while
Ridin' 'round the herd at night.

Hears her voice in every breeze
Sweepin' o'er the moonlit plain.
An' in every cloud he sees
That dear sainted face again.
As the memories on him pile
Lots o' them have got a bite
Keener than a sarpint's while
Ridin' 'round the herd at night.

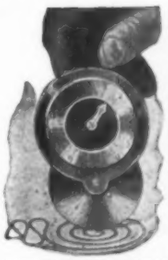
Ain't a preacher anywhere
That can make a feller fret,
That kin make him stop an' stare
All himself with keen regret,
Like ol' conscience when it jars
Up his sense o' wrong an' right
When alone beneath the stars
Ridin' 'round the herd at night.

OPPOSITION MADE HIM RICH.

By a St. Paul Merchant.

When I was a young man I set up in trade and took a store where there was not another store within a quarter of a mile, thinking I should do more where there were no others, but at the end of the year I found all that I had made could be put in my eye. I sat down one day, thinking my lot was a mighty hard one, and told my clerk I was going out for a while and that he must keep a sharp lookout for customers. I went down town, and looking around found two or three stores were doing a very good trade near together, and in passing one of these stores I found the owner quite a talkative man. We put our heads together, and in the course of a week the store directly opposite his received my stock in trade, and a coat of blue paint on the outside, while his received a coat of green. The first day I did nothing but stand at the door and look pouty at the green store, and my friend stood on his steps looking ditto at me. As people came in I commenced running down the green store, and the latter always run down the blue, so that between us both we built up a trade that was quite lively. People having "taken sides," and newcomers always purchasing of one or the other, we gradually grew rich, and at the end of some dozen years we settled up and found that opposition, or what answered that name, had brought custom and had made my fortune.

The government postal telegraph authorities of London are afraid that the electrical current proposed to be used by electric railway companies on old or new lines will interfere with the network of wires used for the transmission of messages, and parliament has been called on for protection.



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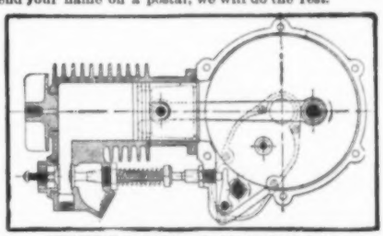

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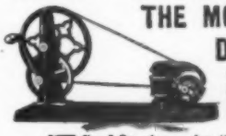

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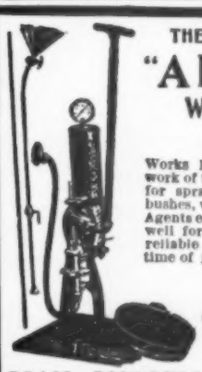

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